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Successful control of a pertussis outbreak in a university children's hospital☆

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Summary
Objectives: Healthcare workers (HCWs) are at high risk for acquisition and/or transmission of *Bordetella pertussis*. We report an outbreak of pertussis in a children's hospital involving three HCWs.
Design: Clinical and epidemiological observations.
Results: A 62-year-old nurse was suffering from a paroxysmal cough, choking, and significant sleep disturbances of 3 weeks duration; a diagnosis of pertussis was made by PCR. At the time of diagnosis, 25 HCWs working on the same ward as the index case were identified as having been exposed. Of these, seven complained of a current cough illness. PCR was positive for *B. pertussis* in two of them (both with paroxysmal cough), and they were treated with clarithromycin p.o. Asymptomatic HCWs received postexposure prophylaxis with azithromycin p.o. None of these HCWs, and none of the patients hospitalized on the index case's ward, developed a cough illness during the following 4 weeks.
Conclusions: Pertussis should be suspected in HCWs with prolonged cough illness, and immediate action is required to limit spread of the disease.

Introduction

Pertussis is a highly contagious infectious disease of the respiratory tract caused by *Bordetella pertussis*. Although classically known as a disease of young children, the importance of pertussis in adolescents and adults has been emphasized.[1] The incidence of reported pertussis has recently been increasing in many countries despite effective childhood immunization programs, and most cases of pertussis are now observed in very young, unimmunized infants and in previously vaccinated adolescents and adults.[2] Further, adults with pertussis have been recognized as an important source of infection in unvaccinated or incompletely vaccinated infants. Importantly, healthcare workers (HCWs) are at high risk for acquisition and/or transmission of *B. pertussis*.[3]

We report an outbreak of pertussis in a children's hospital that highlights the difficulty of early case detection and the importance of immediate action.

Methods

After identification of the index case, active case finding and surveillance were performed over four consecutive

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weeks by individual interviews with all HCWs on the affected ward. Further, files of all exposed patients on the ward were screened for the occurrence of new respiratory signs and symptoms compatible with *B. pertussis* infection.

Results

A 62-year-old nurse without regular patient contact, head of a general pediatric ward for children with acute and chronic diseases, was suffering from a paroxysmal cough, choking, and significant sleep disturbance of 3 weeks duration, when a diagnosis of pertussis was suspected after consultation with the pediatric infectious disease specialist. This prompted collection of a nasopharyngeal aspirate for PCR for *Bordetella spp* infection, which was positive for *B. pertussis* 24 hours later.[4] Treatment with clarithromycin 2×250 mg p.o. for 14 days was immediately started and she was sent home.

At the time of diagnosis of the index case, 25 HCWs working on the same ward as the index case were identified as having potentially been exposed, i.e., they had been in direct contact with the index patient since the onset of her symptoms. Of these, seven complained of a current cough illness of variable duration, but only two had typical signs of pertussis, i.e., paroxysmal coughing spells; 18 HCWs were asymptomatic. A nasopharyngeal aspirate for PCR for *B. pertussis* was collected from the seven symptomatic HCWs and an immediate treatment with clarithromycin 2×250 mg p.o. for 14 days was started. They were also sent home for 5 days. PCR was positive for *B. pertussis* in two of these seven symptomatic HCWs: a 59-year-old nurse with unknown pertussis immunization status and an unimmunized 23-year-old nurse. Both suffered from a paroxysmal cough. The asymptomatic HCWs received postexposure prophylaxis with azithromycin (500 mg p.o. on day 1, 250 mg p.o. on days 2–5). None of these HCWs, and none of the patients hospitalized on the index case's ward, developed a new cough illness during the following 4 weeks. Continuous surveillance of exposed patients was ongoing after their hospital discharge as part of standard surveillance for the detection of nosocomial infections, which may manifest only after discharge (implemented at our institution in October 2004).

Despite antibiotic treatment the index case continued to cough for several months. No complications occurred in the three HCWs with confirmed pertussis.

Discussion

Although pertussis in adults may present with typical symptoms such as paroxysmal cough, whooping, or post-tussive vomiting, it frequently remains undiagnosed.[5] A diagnosis of pertussis should be suspected in any prolonged cough and this requires microbiological confirmation. In this regard, PCR and especially serology are superior to culture due to higher sensitivities, but no test is 100% sensitive.[4,6] As a limitation of our investigation, serology could not be applied due to the lack of specific assays (anti-pertussis toxin) in our laboratory. Although false-positive PCR tests may occur, rigorous quality controls in our microbiological laboratories make it unlikely that this occurred.

Since we only applied PCR in the investigation of this outbreak, we may have missed cases of pertussis among the five exposed PCR-negative HCWs with a cough illness. Therefore we think that our pragmatic approach of treating all symptomatic HCWs with clarithromycin was justified to interrupt further transmission of *B. pertussis* in our institution, and this strategy was successful. Furthermore, prophylaxis with azithromycin was recommended to and accepted by all other HCWs potentially exposed to one or more of their colleagues with pertussis. We chose azithromycin for prophylaxis because of its apparent efficacy and convenient dosing schedule.[7]

Outbreaks of pertussis among HCWs in pediatric units have been described before. In a pediatric emergency unit in France, 10 of 59 exposed HCWs acquired pertussis from a nurse as the primary case.[3] In a further hospital outbreak of pertussis in France, a total of 91 exposed individuals (HCWs and patients) developed cough and 17 were classified as confirmed cases (15 HCWs, two patients).[8] The economic consequences were substantial with a total cost of 46 661 Euros due to diagnosis, treatment, and loss of productivity.

We are convinced that rapid identification and treatment of symptomatic contact persons as well as the provision of antibiotic prophylaxis for asymptomatic, exposed staff efficiently interrupted this small outbreak of pertussis among HCWs. Intensified efforts were implemented in our institution to educate our staff about the importance of reporting symptoms that might indicate a potentially contagious disease in a timely fashion to allow early interventions if needed. This has led to an increased number of illness reports by HCWs to our occupational healthcare service since.

Fortunately, transmission to patients did not occur, which is important because of the potential hazards caused by *B. pertussis* infection. The fact that none of the patients developed pertussis might be explained either by a lack of bacterial transmission and/or protection by previous immunizations or pertussis disease. However, this was not formally assessed.

In addition to antibiotic prophylaxis, prevention of pertussis by immunization should be considered. Currently, only few countries have recommendations to immunize HCWs against pertussis.[9] In Switzerland, modifications in the pertussis immunization strategy are currently being discussed. We believe that it would be worthwhile to consider universal immunization of young adults. Alternatively, selective immunization of high risk groups such as HCWs, childcare workers, and parents of young children ('cocoon strategy') could contribute to reduce the overall burden of pertussis.[9] In fact, success of such a strategy in HCWs has been demonstrated in one study, where immunization of HCWs resulted in complete absence of *B. pertussis* infections in HCWs during a follow-up period of 6 months.[10]

Conflict of interest: No conflict of interest to declare.

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